

**SECOND FIVE-YEAR REVIEW REPORT FOR
HORSESHOE ROAD AND ATLANTIC RESOURCES SUPERFUND SITES
MIDDLESEX COUNTY, NEW JERSEY**



Prepared by

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

| | |
|-----------|---|
| ADC | Atlantic Development Corporation |
| ARAR | Applicable or Relevant and Appropriate Requirement |
| ARC | Atlantic Resources Corporation |
| CEA | Classification Exception Area |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CIC | Community Involvement Coordinator |
| EPA | United States Environmental Protection Agency |
| FYR | Five-Year Review |
| HR | Horseshoe Road |
| HRDD | Horseshoe Road Drum Dump |
| ICs | Institutional Controls |
| LTM | Long-term Monitoring |
| MCUA | Middlesex County Utilities Authority |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NJDEP | New Jersey Department of Environmental Protection |
| NPL | National Priorities List |
| O&M | Operation and Maintenance |
| OU | Operable Unit |
| PAHs | Polycyclic aromatic hydrocarbons |
| PCBs | Polychlorinated biphenyls |
| PRP | Potentially Responsible Party |
| RAO | Remedial Action Objectives |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| SPD | Sayreville Pesticide Dump |
| TBC | To be considered |
| TI waiver | Technical Impracticability waiver |
| UU/UE | Unlimited use and unrestricted exposure |

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the second FYR for the Horseshoe Road and Atlantic Resources Superfund Sites. The triggering action for this statutory review is December 14, 2017, the completion date of the previous FYR. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

Both Superfund Sites consist of three operable units (OUs). Two OUs, OU2 and OU3, will be addressed in this FYR. OU1, which is not covered in this FYR, addresses building demolition. OU2 addresses on-site soil and groundwater. OU3 addresses contaminated sediments in the marsh adjacent to the OU2 areas, and sediments in the Raritan River.

The Horseshoe Road and Atlantic Resources Superfund Sites FYR was led by Brennan Woodall, Remedial Project Manager (RPM) for the EPA. Participants included Kathryn Flynn – EPA Hydrologist, Michael Clemetson – EPA Ecological Risk Assessor, Stephanie Kim – EPA Human Health Risk Assessor, and Pat Seppi – EPA Community Involvement Coordinator (CIC). The Potentially Responsible Parties (PRPs), and town of Sayreville, were notified of the initiation of the FYR. The review began on 4/12/2022.

Site Background

The Horseshoe Road (HR) site is a 12-acre property located in Sayreville, Middlesex County, New Jersey. The site includes three areas: (1) the former Atlantic Development Corporation facility (ADC); (2) the Sayreville Pesticide Dump (SPD); and (3) the Horseshoe Road Drum Dump (HRDD) (Figures 1 and 2 of Appendix B). The two dump sites were associated with the ADC facility and the adjacent Atlantic Resources Corporation facility. The ADC facility contained three buildings and associated process equipment which were leased by several companies. These companies produced roofing materials, sealants, polymers, urethane and epoxy resins, epoxy pigments, wetting agents and pesticide intermediates among other products.

The adjacent Atlantic Resources Corporation (ARC) site is a 4.5-acre property also located on Horseshoe Road. It was the location of a precious metals recovery facility, operated by several companies, the last of which was the Atlantic Resources Corporation.

Both sites are located on the south shore of the Raritan River, and are bordered to the east by railroad tracks belonging to Conrail with Middlesex County Utilities Authority (MCUA) property bordering the east side of the railroad tracks. The property to the west of the sites, on the shore of the Raritan River, is currently undeveloped. Portions of this property were previously used to dispose of dredge spoils from local shipping channels. The marsh, which was a component of the OU3 cleanup, is bounded on the east and south by the upland portions of the two sites and on the west by remnants of a dock used by the Crossman Company. The Crossman Company mined clays for brick manufacturing and built a rail line from its clay pits in Sayreville to the Raritan River. Remnants of the rail line and the former Crossman Dock bound the western edge of the Marsh. To the southwest lies the Sayreville facility of Gerdau Ameristeel, and to the southeast, approximately one-half mile away, lies a residential neighborhood containing approximately 47 homes. The areas described above are served

by municipal water; about 14,000 people obtain drinking water from public wells within four miles of the sites.

FIVE-YEAR REVIEW SUMMARY FORM

| SITE IDENTIFICATION | | |
|--|--|--|
| Site Name: Horseshoe Road and Atlantic Resources | | |
| EPA ID: NJD980663678 (HR) and NJD981558430 | | |
| Region: 2 | State: NJ | City/County: Sayreville/Middlesex |
| SITE STATUS | | |
| NPL Status: Final | | |
| Multiple OUs? Yes | Has the site achieved construction completion? Yes | |
| REVIEW STATUS | | |
| Lead agency: EPA | | |
| Author name (Federal or State Project Manager): Brennan Woodall | | |
| Author affiliation: U.S. Environmental Protection Agency | | |
| Review period: 4/12/2022 - 7/14/2022 | | |
| Date of site inspection: 6/27/2022 | | |
| Type of review: Statutory | | |
| Review number: 2 | | |
| Triggering action date: 12/14/2017 | | |
| Due date (five years after triggering action date): 12/14/2022 | | |

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Building Materials on the site contained polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and antimony which pose both a cancer and non-cancer risks.

Surface Soil on these sites contained methoxychlor, PCBs, benzo(a)pyrene, benzo(b)fluoranthene, ideno(1,2,3-cd)pyrene, antimony at concentrations that posed a cancer risk due to incidental ingestion and dermal contact. The ecological risk assessment showed that site surface soils contaminated with PCBs, arsenic, chromium, lead, zinc, and cyanide posed a potential risk to short-tailed shrews and red-tailed hawks.

Subsurface Soil on these sites contained 1,2-dichloroethane, PCBs, and arsenic at concentrations that posed a cancer risk due to incidental ingestion and dermal contact and act as a source of groundwater contamination.

Groundwater on these sites contain benzene, 1,2-dichloroethane, and trichloroethylene (TCE) at concentrations that pose a cancer risk due to ingestion and vapor inhalation.

River and Marsh Sediment contain elevated levels of arsenic that posed a risk to future resident receptors due to contact with surface water, sediment, and consumption of shellfish. In addition, ecological receptors such as osprey, herring gulls, and mammalian species were at risk due to food chain exposures to arsenic, mercury, and PCBs contained in the marsh and river sediments.

Response Actions

The sites first came to EPA's attention in 1981, when a brush fire at the HRDD area exposed approximately 70 partially filled drums containing acetonitrile, silver cyanide and ethyl acetate. At that time the State took the lead role in addressing both sites. Shortly thereafter, the commercial operations at both facilities ended.

In 1985, the New Jersey Department of Environmental Protection (NJDEP) requested that EPA take the lead role in the cleanup of the sites. Since that time EPA has performed 10 removal actions at both sites. These removal actions stabilized the sites by removing more than 3,000 drums, cleaning up dioxin and mercury spills, emptying and disposing of materials found in numerous tanks and vats on both sites, and excavating and disposing of contaminated soil and debris. The Horseshoe Road site was placed on the National Priorities List (NPL) in 1995; the ARC site was placed on the NPL in 2002.

The OU1 Record of Decision (ROD) was signed on September 1, 2000 and called for the demolition of buildings and process equipment at both sites. In the OU1 ROD, EPA stated the following remedial action objectives for contaminated buildings and process equipment at the Horseshoe Road and ARC sites:

1. Prevent or minimize human exposure to contaminants in building materials.
2. Prevent or minimize uptake of contaminants in building materials by biota.
3. Prevent or minimize migration of contaminants in building materials via windblown dust and surface runoff.

The major components of the selected response measure for OU1 include:

- demolition of buildings and structures;
- surface cleaning and recycling of metal/concrete/brick;
- decontamination of concrete slabs as necessary; and
- off-site disposal of remaining demolition debris.

The OU2 ROD was signed on September 30, 2004 and called for removal of contaminated on-site soil for off-site disposal, with backfilling of excavated areas, and restoration of wetlands. The OU2 ROD also included a technical impracticability (TI) waiver for groundwater, which recognized that complete restoration of the groundwater was not feasible due to the clay rich soils. As part of the waiver the OU2 ROD required removal of contaminated soils that acted as a source to groundwater to the extent practical. The OU2 remedy requires institutional controls in the form of a deed notice because contamination left behind does not allow for unrestricted use. In the OU2 ROD, EPA stated the following remedial action objectives for contaminated soil and Groundwater at the Horseshoe Road and ARC sites:

1. Reduce or eliminate the direct contact threat associated with contaminated soil to levels protective of a commercial or industrial use, and protective of the environment;
2. Prevent public exposure to contaminated groundwater that presents a significant risk to human health and the environment;
3. Minimize or eliminate contaminant migration to the groundwater and surface waters;
4. Minimize or eliminate organic vapor migration from groundwater into future indoor

environments that may be built on the sites.

The major components of the selected response measure for OU2 include:

- Excavation of approximately 52,000 and 10,000 cubic yards of contaminated soil and debris on the Horseshoe Road and Atlantic Resources Corporation sites, respectively, including an estimated 10,000 and 6,000 cubic yards of deeper soils that act as a continuing source of groundwater contamination on the Horseshoe Road and the Atlantic Resources Corporation sites, respectively;
- off-site transportation and disposal of contaminated soil and debris, with treatment as necessary;
- off-site treatment of all RCRA-hazardous wastes prior to land disposal;
- backfilling and grading of all excavated areas with clean fill, with the exception of the HRDD area, which would be graded to become part of the neighboring marsh;
- institutional controls, such as a deed notice or covenant, to prevent exposure to residual soils that may exceed levels that would allow for unrestricted use;
- institutional controls, including a Classification Exception Area (CEA), to restrict the installation of wells and the use of groundwater in the area of groundwater contamination; and
- implementation of a long-term groundwater sampling and analysis program to monitor the nature and extent of groundwater contamination at the sites, in order to assess the migration and possible attenuation of the groundwater contamination over time.

Table 1: Operable Unit 2 Remediation Goals

| Analyte | Surface Soil Remediation Goals (mg/kg) | Subsurface Soil Remediation Goals (mg/kg) |
|-------------------------|---|--|
| Benzene | 1 | 1 |
| Chlorobenzene | | 1 |
| Chloroform | | 1 |
| 1,2-Dichloroethane | | 1 |
| Methylene Chloride | 1 | 1 |
| Tetrachloroethene | 1 | 1 |
| Toluene | 500 | |
| Trichloroethene | 1 | 1 |
| Xylenes | 67 | 67 |
| Benzo(a)Anthracene | 0.5 | |
| Benzo(b)Fluoranthene | 0.5 | |
| Benzo(k)Fluoranthene | 5 | |
| Benzo(a)Pyrene | 0.05 | |
| Chrysene | 50 | |
| Hexachloroethane | | 100 |
| Indeno(1,2,3-c,d)Pyrene | 0.5 | |
| Dibenz(a,h)Anthracene | 0.05 | |
| 1,2,4-Trichlorobenzene | | 100 |
| Aldrin | 0.03 | |
| Dieldrin | 0.03 | |
| Methoxychlor | 50 | 50 |
| PCBs (Total) | 1 | |
| Antimony | 300 | |
| Arsenic | 20 | |

The OU3 ROD was signed on June 22, 2009, and called for the excavation and off-site disposal of marsh sediments and dredging and off-site disposal of river sediments. In the OU3 ROD, EPA stated the following remedial action objectives for contaminated sediments at the Horseshoe Road and ARC sites:

Marsh Sediments

1. Reduce human health risks from exposure, including ingestion, inhalation, and dermal contact, to contaminants in the surface and sub-surface sediments to acceptable levels.
2. Reduce risks to environmental receptors from exposure to contaminants in the sediments to acceptable levels.
3. Minimize the migration of contaminated sediments to the Raritan River through surface water runoff or flooding.

River Sediments

1. Reduce the potential for human health risks from exposure to river sediments within the low-tide mudflat in front of the sites, through ingestion or dermal contact, to acceptable levels.
2. Reduce exposure to sediments deposited in the river adjacent to the sites with highly elevated contaminant concentrations that contribute to the degradation of the Raritan River Estuary, and result in risks to ecological receptors, including benthic aquatic organisms, shellfish, fish, birds, and mammals.

The major components of the selected response measure for OU3 include:

- Excavation, transportation, and disposal of approximately 21,000 cubic yards of contaminated sediments from the Horseshoe Road/ARC Marsh;
- dredging of approximately 14,000 cubic yards of contaminated sediments from the Raritan River;
- dewatering and off-site disposal of excavated/dredged sediments in an appropriate land disposal facility;
- backfilling and grading of all excavated marsh areas with clean cover material to allow for reestablishment of wetland habitat;
- filling of the dredged river area with clean cover material that will support the reestablishment of a benthic community in surface sediments;
- institutional controls in the Marsh, such as a deed notice or covenant, to prevent exposure to residual soils that may exceed levels that would allow for unrestricted use that may remain at the completion of the remedial action;
- institutional controls for the river sediments such as a restricted navigation area, to prevent disruption of cover in the event contaminated sediments are left at depth; and
- on-site restoration of approximately six acres of wetlands disturbed during implementation of the remedy.

Table 2: Operable Unit 3 Remediation Goals

| Media | Arsenic (mg/kg) | Mercury (mg/kg) |
|-----------------------------------|------------------------|------------------------|
| River Sediments | 100 | 2 |
| Marsh Surface Sediments | 32 | 2 |
| Marsh Sediments (below 1 foot) | 160 | Not applicable |

Status of Implementation

- EPA completed the OU1 remedy on the HR site in 2001, and the PRP group completed the OU1 remedy on the ARC site in 2003.

- In August 2010, EPA completed the OU2 soil remediation for the HR site, removing approximately 190,000 tons of contaminated soil from the site. In May 2014, the PRP group for the ARC site completed the OU2 soil remediation for the ARC site and the HR Drum Dump area of the HR site, removing approximately 120,000 tons of contaminated soil from the site. The institutional controls called for in the ROD have not been implemented.
- In August of 2015, EPA began the OU3 sediment remediation for both sites. In January 2017, EPA completed the removal and backfilling of approximately 70,000 tons of contaminated sediment from both the marsh and river. EPA completed restoration of the marsh wetlands in September 2021. The institutional controls called for in the ROD have not been implemented.
- A long-term groundwater monitoring program started in 2019 at the HR site. Similarly, a long-term groundwater monitoring program for the ARC site is expected to begin in 2023.

Table 3: IC Summary Table

Summary of Planned and/or Implemented ICs

| Media, engineered controls, and areas that do not support UU/UE based on current conditions | ICs Needed | ICs Called for in the Decision Documents | Impacted Parcel(s) | IC Objective | Title of IC Instrument Implemented and Date (or planned) |
|--|-------------------|---|---------------------------|---|---|
| Soil (OU2) | Yes | Yes | On-site Soil | Prevent disruption of the soil cap | Planned deed notices |
| Groundwater (OU2) | Yes | Yes | On-site Groundwater | Prevent installation of groundwater wells | CEA for HR was implemented July 2022. CEA planned for ARC. |
| Sediments (OU3) | Yes | Yes | Marsh and River Sediments | Prevent disruption of cap materials in both the marsh and river | Planned deed notice for marsh. The appropriate IC for the river sediments has yet to be determined. |

Institutional Controls and Monitoring

A long-term groundwater monitoring program was initiated in 2019 for the HR site. A long-term groundwater monitoring program at the ARC and HRDD areas is anticipated to begin in 2023. Since completion of the OU3 remedy in September 2021, EPA has placed a CEA on the HR site and the PRP group has initiated efforts to place a CEA on the ARC site to prevent disruption of the soil cover and to prohibit drilling of groundwater wells. EPA and the PRP group have also initiated efforts to place deed notices on the OU2 soils for both sites, as well as the OU3 dredged areas in the marsh. Upon determination of the appropriate IC for the dredged areas in the Raritan River, EPA will initiate efforts to place the IC on the river sediments.

Operation & Maintenance

Under the HR long-term groundwater monitoring program initiated in 2019, groundwater at the HR site was sampled three times during the base year (2019 – 2020) and once annually in both 2021 and 2022. Annual monitoring will continue to be performed all subsequent years of the monitoring program. The long-term groundwater monitoring program at the ARC and HRDD areas is expected to begin in early 2023. Monitoring will be performed on a semi-annual basis during the first two years of the program, and annually thereafter.

Regular inspections of the soil and sediment caps for the OU2 and OU3 remedies will be a component of the forthcoming institutional controls. The ICs will require biennial certifications of the continued protectiveness of the remedial actions.

Climate Change Assessment

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site (Appendix C).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** FYR as well as the recommendations from the **last** FYR and the current status of those recommendations.

Table 4: Protectiveness Determinations/Statements from the 2017 FYR

| OU # | Protectiveness Determination | Protectiveness Statement |
|-------------|-------------------------------------|--|
| 2 | Short-term Protective | The OU2 Remedy currently protects human health and the environment because there are no completed pathways to contaminated soil or groundwater and access to the site is controlled. However, institutional controls intended to maintain the soil cover and prevent access to groundwater need to be placed for the OU2 remedy to remain protective in the long-term. |
| 3 | Will be Protective | The OU3 Remedy is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. |

Table 5: Status of Recommendations from the 2017 FYR

| OU # | Issue | Recommendations | Current Status | Current Implementation Status Description | Completion Date (if applicable) |
|------|--|---|----------------|---|---------------------------------|
| 2 | A deed notice for continued use of the former Horseshoe Road and Atlantic Resources properties as non-residential (commercial/light industrial), identified in the OU2 ROD, has yet to be implemented. | Place deed notice on former Horseshoe Road and Atlantic Resources properties. | Ongoing | Now that construction for the OU3 remedy and restoration of the OU3 marsh have been completed, the placement of deed notices for OU2 on the Horseshoe Road and Atlantic Resources properties is being implemented by EPA and the PRPs, respectively. The planned completion date is 2024. | Estimated 2024 |

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On Monday, August 15, 2022, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, and Puerto Rico, including the Horseshoe Road and Atlantic Resources sites. The announcement can be found at the following web address: <https://www.epa.gov/superfund/R2-fiveyearreviews>.

In addition to this notification, the EPA Community Involvement Coordinator (CIC) for the site, Patricia Seppi, posted a public notice on the EPA site webpages (<https://www.epa.gov/superfund/horseshoe-road> and <https://www.epa.gov/superfund/atlantic-resources>) and provided the notice to the Borough of Sayreville, New Jersey, by email on September 13, 2022 with a request that the notice be posted in municipal offices and on the borough/township webpages. This notice indicated that a Five-Year Review (FYR) would be conducted at the Horseshoe Road and Atlantic Resources sites to ensure that the cleanup at the sites continues to be protective of human health and the environment. Once the FYR is completed, the results will be made available at the local site repositories located at the Sayreville Public Library, 1050 Washington Road, Parlin, New Jersey. In addition, the final report will be posted on the following websites: <https://www.epa.gov/superfund/horseshoe-road> and <https://www.epa.gov/superfund/atlantic-resources>. Efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Long-Term Groundwater Monitoring at Horseshoe Road Site

A long-term groundwater monitoring program was initiated in 2019 for the ADC, SPD, and marsh areas of the HR site. Three sampling events took place during the base year (2019 – 2020), and one sampling event took place during 2021. Each sampling event included the collection of groundwater samples from 13 monitoring wells strategically located to monitor source areas and the migration of contamination in the overburden aquifer, and one round of synoptic groundwater level measurements collected from the 32 wells onsite. The results of these

sampling events were presented in the Year 1 and Year 2 Long-Term Monitoring Groundwater Reports for the HR site.

Based on the results of the Year 1 and Year 2 Reports, the contaminated groundwater plume is generally located in the central and western portions of the site, more specifically within the wetland area and near the ARC site. The greatest number of exceedances of the CEA target concentrations for VOCs were observed in groundwater samples from monitoring well PMW-15, located on the ADC property. Additional VOC exceedances were noted in groundwater samples collected from PMW-16 and PMW-17D. Likewise, multiple exceedances for metals were generally observed in groundwater samples collected from monitoring wells in or near the wetlands along the western edge of the site.

In 2021, the highest TCE concentration was 14.3 micrograms per liter ($\mu\text{g/L}$) at PMW-15, the highest vinyl chloride concentration was 25.8 $\mu\text{g/L}$ at PMW-15, and the highest benzene concentration was 7.41 $\mu\text{g/L}$ at PMW-15. In most other instances of VOC exceedances in 2021, concentrations were between 1 – 10 $\mu\text{g/L}$. For the exceedances observed for metals, the highest concentrations of aluminum and lead were 5,330 $\mu\text{g/L}$ and 29.3 $\mu\text{g/L}$, respectfully, at PMW-16. The highest concentrations of iron and manganese were 148,000 $\mu\text{g/L}$ and 5,080 $\mu\text{g/L}$, respectfully, at PMW-15. The highest concentrations of nickel and chromium were 890 $\mu\text{g/L}$ and 986 $\mu\text{g/L}$, respectfully, at PMW-17s. And the highest concentration of arsenic was 286 $\mu\text{g/L}$ at PMW-18s.

The most recent Year 2 (2021) contaminant concentrations are generally the same or lower than those observed during Year 1 (2019/2020) and considerably lower than concentrations observed during the RI. The lower contaminant concentrations observed in Year 2 indicate that the removal of contaminated soil during the RA has reduced the contaminant load to groundwater. In addition, the last 2 years of data suggest that natural attenuation could be occurring at the site. Redox conditions plus ethene and ethane concentrations show that the site conditions remain favorable for natural attenuation to occur. It is too early to evaluate concentration trends and plume behavior. Additional trend analysis and plume delineations will be completed after Year 3 sampling to further evaluate the effectiveness of natural attenuation at this site. Additional analysis and delineations will be discussed in the next FYR.

A long-term groundwater monitoring program at the ARC and HRDD areas is anticipated to begin in 2023.

Site Inspection

The inspection of the Site was conducted on 6/27/2022. In attendance were Brennan Woodall, the RPM for EPA, Kathryn Flynn, Hydrologist for EPA, Stephanie Kim, Human Health Risk Assessor for EPA, and Michael Clemetson, Ecological Risk Assessor for EPA. The purpose of the inspection was to assess the protectiveness of the remedy. Since the last five year review inspection, the implementation of the OU3 remedy has been completed, along with the wetland restoration. The OU2 and OU3 areas are covered with vegetation and outcroppings of invasive Phragmites in the wetland areas are minimal. Deer fencing around the wetland areas remains in place. Some sections of deer fencing have been compromised, however, it is expected that the deer fencing will be removed entirely pending a final wetland inspection by NJDEP by the end of 2022.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

The OU2 remedy removed contaminated surface soils and deeper soil that acted as a source of groundwater contamination. The excavated areas were then filled with clean fill that acts as a cap. The OU3 remedy removed contaminated sediment from the Raritan River and placed a sand cap to prevent ecological exposures to deeper

contaminated sediment left in place. The OU3 remedy also excavated contaminated sediments from the marsh. The excavation was backfilled, forming a cap which has been revegetated with wetland plant species. The selected remedy for each media included removal of the contaminated material from the property. A TI waiver, was applied to groundwater. Given that the remedies removed the contaminated materials from the sites, the exposure pathways associated with surface soil, subsurface soil, and sediment have been eliminated. Although the groundwater did not have an active remedy, soils that acted as source areas to groundwater were removed as part of the OU2 remedy. Groundwater monitoring data from the marsh, ADC, and SPD areas has shown that contaminant levels in groundwater have not increased following the OU2 soil removal. After the second year of monitoring, groundwater contaminant levels have generally remained the same or decreased from levels recorded during the first year of monitoring, and site conditions that provided justification for the TI waiver are still valid. In addition, there are no private wells on the property or within the plume area, thus there is no complete pathway for groundwater exposure. Thus, from a human health and ecological exposure perspective, the remedial actions have eliminated the exposure pathways and are functioning as intended.

Implementation of Institutional Controls and Other Measures

The OU2 ROD called for a deed notice for soils and a CEA for the on-site groundwater. A CEA has been placed on the HR site and a CEA for the ARC site is in the process of being implemented. The OU3 ROD called for a deed notice for marsh sediments and an IC for river sediments. The deed notice for the marsh sediments is in the process of being implemented and EPA plans to implement the IC for the river once the appropriate IC has been determined.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Human Health Risk

As indicated in the first FYR (2017), the human health risk assessment (HHRA) evaluated exposure to on-site trespassers/recreators, commercial/industrial workers and construction workers for exposure through ingestion, inhalation and dermal contact with surface soil, subsurface soil, groundwater, surface water and sediment. The exposure assumptions, pathways, and receptors that were used to estimate the potential risks and hazards to human health followed the standard risk assessment paradigm in use at the time. The exposure assumptions, pathways, and receptors are still valid. Some of the toxicity values used to calculate the risks and hazards have changed; however, the changes would not impact the remedial decision that was made for the Site. Furthermore, the remedial actions objectives (RAOs) used at the time of the remedy selection are still valid and remain protective of the human health and the environment.

Changes in Standards and TBCs

The cleanup levels that were identified in the ROD were based upon the existing federal and state applicable or relevant and appropriate requirements (ARARs) or to be considered (TBC) requirements in place at the time. Some of the soil and groundwater standards included in the 2004 ROD (OU2) have been revised to be more stringent; however, the soil remediation standards are based on migration to groundwater which does not influence direct contact exposure and a TI waiver was applied to groundwater. Importantly, all the cleanup goals that were chosen for the ROD remain protective of human health and are still valid.

Vapor intrusion

The vapor intrusion pathway was evaluated in the 2004 ROD and the previous FYR. In the 2004 ROD, it was indicated that while no buildings currently existed on either Site, the future land use indicated a reasonable likelihood of commercial buildings in the area of VOC contamination. Thus, the potential evaluation of vapor intrusion at the Sites should be considered if the Sites are redeveloped for commercial use in the future. At this time, the previous and current evaluations indicate that vapor intrusion is not an issue as there are no buildings on the Sites.

Ecological Risk

The remedy selected in the 2004 ROD (OU2) involved excavation and offsite disposal of contaminated soil along with backfilling using clean soil. The remedy called for in the 2009 ROD (OU3) was excavation and offsite disposal of marsh and river sediment. The marsh and river excavated areas were subsequently backfilled using clean cover material. Approximately six acres of the marsh wetlands that were impacted by the remedy have been restored. The current wetland monitoring report concluded that the facultative and obligate wetland vegetation dominate the area. Although the invasive species percent coverage was below the 10 percent goal, some Phragmites were observed outside of the monitoring plots. Consequently, an invasive species eradication program is being conducted to prevent these species from spreading. Therefore, it appears that the remedy is functioning as intended for ecological receptors.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

No other information has come to light which calls into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

| Issues/Recommendations | |
|---|--|
| OU(s) without Issues/Recommendations Identified in the Five-Year Review: | |
| <i>None</i> | |

| Issues and Recommendations Identified in the Five-Year Review: | | | | |
|---|---|--------------------------------------|------------------------|-----------------------|
| OU(s): 2 and 3 | Issue Category: Institutional Controls | | | |
| | Issue: Deed notices for continued use of the former Horseshoe Road and Atlantic Resources properties as non-residential (commercial/light Industrial), identified in the OU2 and OU3 RODs, have yet to be completed. A deed notice for the OU3 marsh sediments is also needed. | | | |
| | Recommendation: Place deed notices on former Horseshoe Road and Atlantic Resources properties, as well as the marsh sediments. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | PRP - ARC EPA - HR EPA - Marsh | EPA | 9/30/2024 |

| | | | | |
|--------------------------------------|--|--------------------------|------------------------|-----------------------|
| OU(s): 2 | Issue Category: Institutional Controls | | | |
| | Issue: A CEA to prevent groundwater well installation on the Atlantic Resources property has yet to be completed. | | | |
| | Recommendation: Implement the CEA on the Atlantic Resources property. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | PRP | EPA | 9/30/2025 |

| | | | | |
|--------------------------------------|--|--------------------------|------------------------|-----------------------|
| OU(s): 3 | Issue Category: Institutional Controls | | | |
| | Issue: An IC for the Raritan River sediments, called for in the OU3 ROD, has yet to be completed. | | | |
| | Recommendation: Determine the appropriate IC and place it on the area of dredged river sediments. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | EPA | EPA | 9/30/2026 |

VII. PROTECTIVENESS STATEMENT

| Protectiveness Statement(s) | |
|---|---|
| <i>Operable Unit: 2</i> | <i>Protectiveness Determination:</i> Short-term Protective |
| <i>Protectiveness Statement:</i> The OU2 Remedy currently protects human health and the environment in the short-term because there are no completed pathways to contaminated soil or groundwater and access to the site is controlled. However, institutional controls intended to maintain the soil cover and prevent access to groundwater need to be placed for the OU2 remedy to remain protective in the long-term. | |

| Protectiveness Statement(s) | |
|--|---|
| <i>Operable Unit: 3</i> | <i>Protectiveness Determination:</i> Short-term Protective |
| <i>Protectiveness Statement:</i> The OU3 Remedy currently protects human health and the environment in the short-term because there are no completed pathways to contaminated marsh or river sediments and access to the site is controlled. However, institutional controls intended to prevent human disruption of the cover placed over the dredged areas need to be placed for the OU3 remedy to remain protective in the long-term. | |

Sitewide Protectiveness Statement

Protectiveness Determination:

Short-term Protective

Protectiveness Statement: The remedies implemented at the site currently protect human health and the environment in the short-term because there are no completed pathways. In order to remain protective in the long term, institutional controls intended to maintain the soil cover and prevent access to groundwater at OU2 and protect the cover placed over the dredged areas at OU3 need to be implemented.

VIII. NEXT REVIEW

The next FYR report for the Horseshoe Road and Atlantic Resources Superfund Sites is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

- Record of Decision, Operable unit 1- Buildings and Structures, Horseshoe Road Site and The Atlantic Resources site, Sayreville, Middlesex County, New Jersey, **August 2000**
- Remedial Action Report – Operable Unit 1 Horseshoe Road Superfund Site, Sayreville, NJ **May 2001**
- Final Addendum to the Final Revised Feasibility Study for Soil and Groundwater Horseshoe Road and Atlantic Resources Sites Remedial Investigation/Feasibility Study, Sayreville, New Jersey, **July 23, 2002**
- Building Demolition – Final Report, Atlantic Resources Corporation Site, Sayreville, NJ, **July 2003**
- Record of Decision, Operable unit 2- Soil and Groundwater, Horseshoe Road Site and Atlantic Resources Sites, Sayreville, Middlesex County, New Jersey, **September 30, 2004**
- Record of Decision, Operable unit 3- Marsh and River Sediment, Horseshoe Road Site and Atlantic Resources Sites, Sayreville, Middlesex County, New Jersey, **June 22, 2009**
- Final Remedial Action Report – Horseshoe Road Superfund Site, Operable Unit 2 -Soil and Groundwater Remediation, Sayreville, NJ, **August 2010**
- 100% Design Analysis Report – Horseshoe Road and Atlantic Resources Corporation Sites, Operable Unit 3, Sayreville NJ, **August 6, 2014**
- 100% Design Specifications Report – Horseshoe Road and Atlantic Resources Corporation Sites, Operable Unit 3, Sayreville NJ, **August 6, 2014**
- Final Remedial Action Report – Atlantic Resources Corporation site and the Horseshoe Rd. Drum Dump Portion of the Horseshoe Road Complex Sites – Operable Unit 2, Sayreville, NJ, **September 2014**
- Long-Term Monitoring Groundwater Report Year 1 – Horseshoe Road Superfund Site OU2, Sayreville, NJ, **April 2021**
- Annual Wetland Monitoring Report – Horseshoe Road and ARC Superfund Sites OU3, Sayreville, NJ, **September 2021**
- Final Remedial Action Report – Horseshoe Road and Atlantic Resources Corporation Superfund Sites – Operable Unit 3, Sayreville, NJ, **September 2021**
- Long-Term Monitoring Groundwater Report Year 2 – Horseshoe Road Superfund Site OU2, Sayreville, NJ, **December 2021**

APPENDIX B – FIGURES



Figure 1



Figure 2

APPENDIX C – CLIMATE CHANGE ASSESSMENT

According to the *Region 2 Guidance for Incorporating Climate Change Considerations in the Five Year Reviews*, three climate change tools were utilized to assess the Horseshoe Road and Atlantic Resources Superfund Sites. Screenshots from each of the tools assessed are included here.

The first tool used to assess the Borough of Sayreville was *The Climate Explorer*. According to this tool, average daily temperatures are projected to increase. Appendix C, Figure 1 shows the projected increase in the average daily maximum temperature. Appendix C, Figure 2 shows a slight increase in the projected number of days per year with more than 1” precipitation. In addition, frequency of coastal flooding may increase as global sea level rises 0.5 – 2 ft. Appendix C, Figure 3 shows a summary of the top climate concerns for Sayreville.

The second tool utilized was *Risk Factor*. This tool states that flooding is a minor risk and wildfire is a moderate risk in Sayreville over the next 30 years. These risk levels are based on the number of properties that are predicted to be affected (Appendix C, Figure 4). Figures 5 and 6 of Appendix C do not appear to show significant impact from flooding where the Horseshoe Road and Atlantic Resources Superfund Sites are located. Appendix C, Figure 7 compares the percentage likelihood of wildfire at present to the percentage likelihood of wildfire in 30 years. The figure shows the percentage likelihood of wildfire at the Sites as remaining the same (0.1%) over the next 30 years.

The third tool utilized was the *NOAA Sea Level Rise Viewer*. Figure 8 of Appendix C shows the current marsh conditions at the sites, which are situated along the Raritan River. In 2060, this tool projects a sea level rise of 1.64 – 2.53 ft, depending on four different scenarios. Figure 9 of Appendix C shows the projected change in marsh conditions with the High (or higher level of sea rise) scenario selected. In this scenario, some of the marsh area in the vicinity of the sites is projected to become unconsolidated shore, however, this level of sea rise is not expected to impact the marsh and river caps. Figure 10 of Appendix C shows the portion of the marsh area at the site that lies in the shallow coastal flooding area.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.



Figure 1



Figure 2

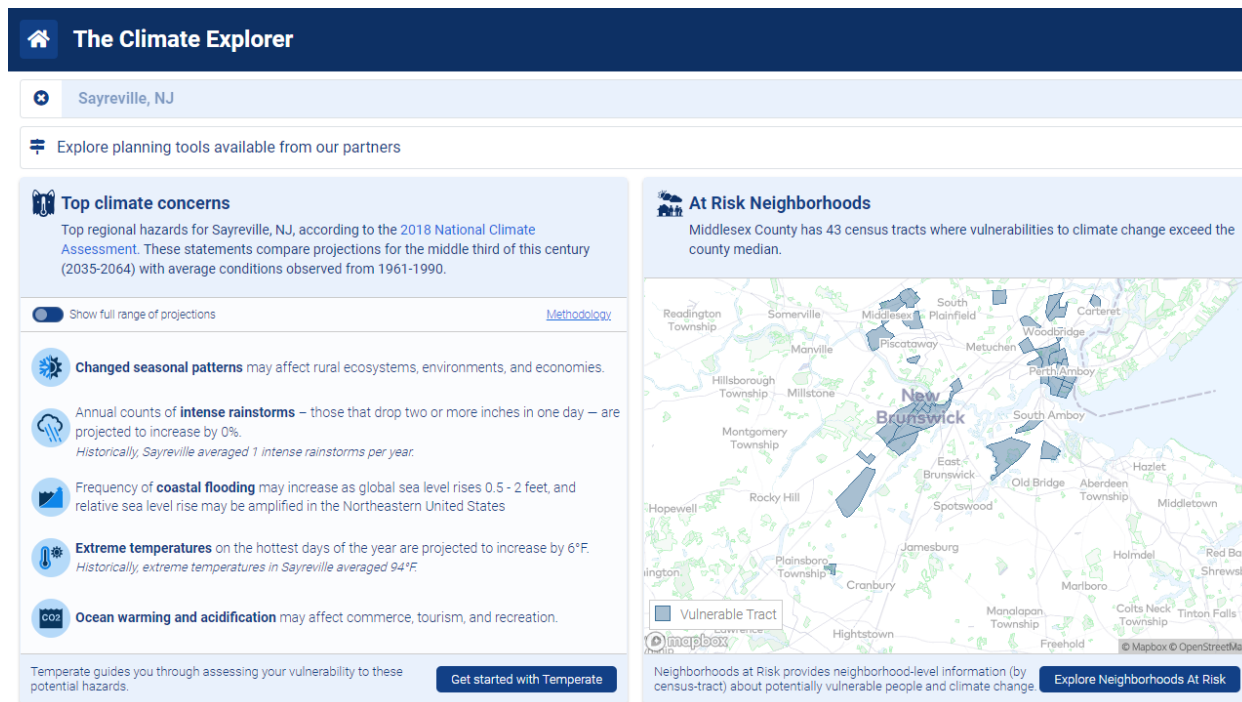


Figure 3

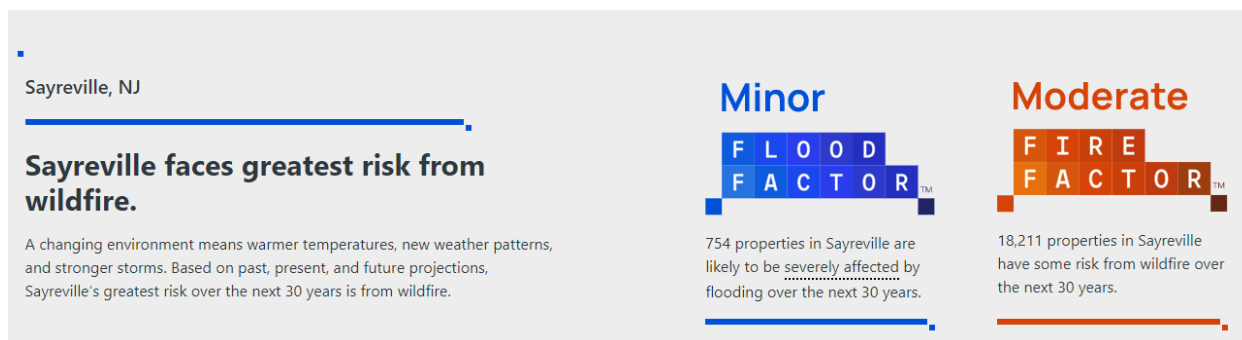


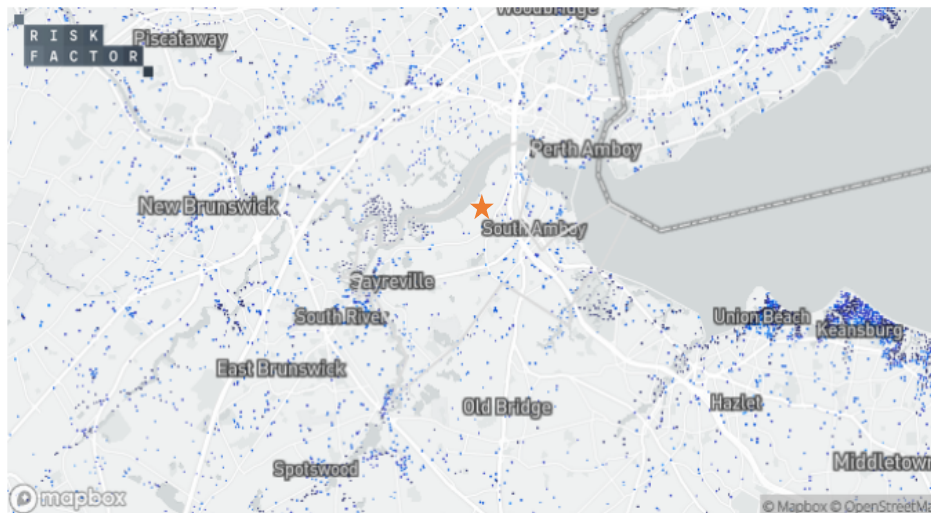
Figure 4

Minor



There are **738** properties in **Sayreville** that have greater than a **26%** chance of being severely affected by flooding over the next 30 years. This represents **0%** of all properties in Sayreville.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Overall, **Sayreville** has a **minor risk of flooding** over the next 30 years, which means flooding is likely to impact day-to-day life within the community. This is based on the level of risk the properties face rather than the proportion of properties with risk.



Sayreville Flood Risk ⓘ

Residential **Minor Risk**

333 out of 12,016 homes ⓘ

Road **Minor Risk**

46 out of 207 miles of roads ⓘ

Commercial **Minor Risk**

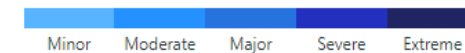
59 out of 415 commercial properties ⓘ

Critical Infrastructure **Minor Risk**

4 out of 20 infrastructure facilities ⓘ

Social Facilities **Minor Risk**

6 out of 23 social facilities ⓘ



View additional community impacts with Risk Factor Pro™.

Figure 5

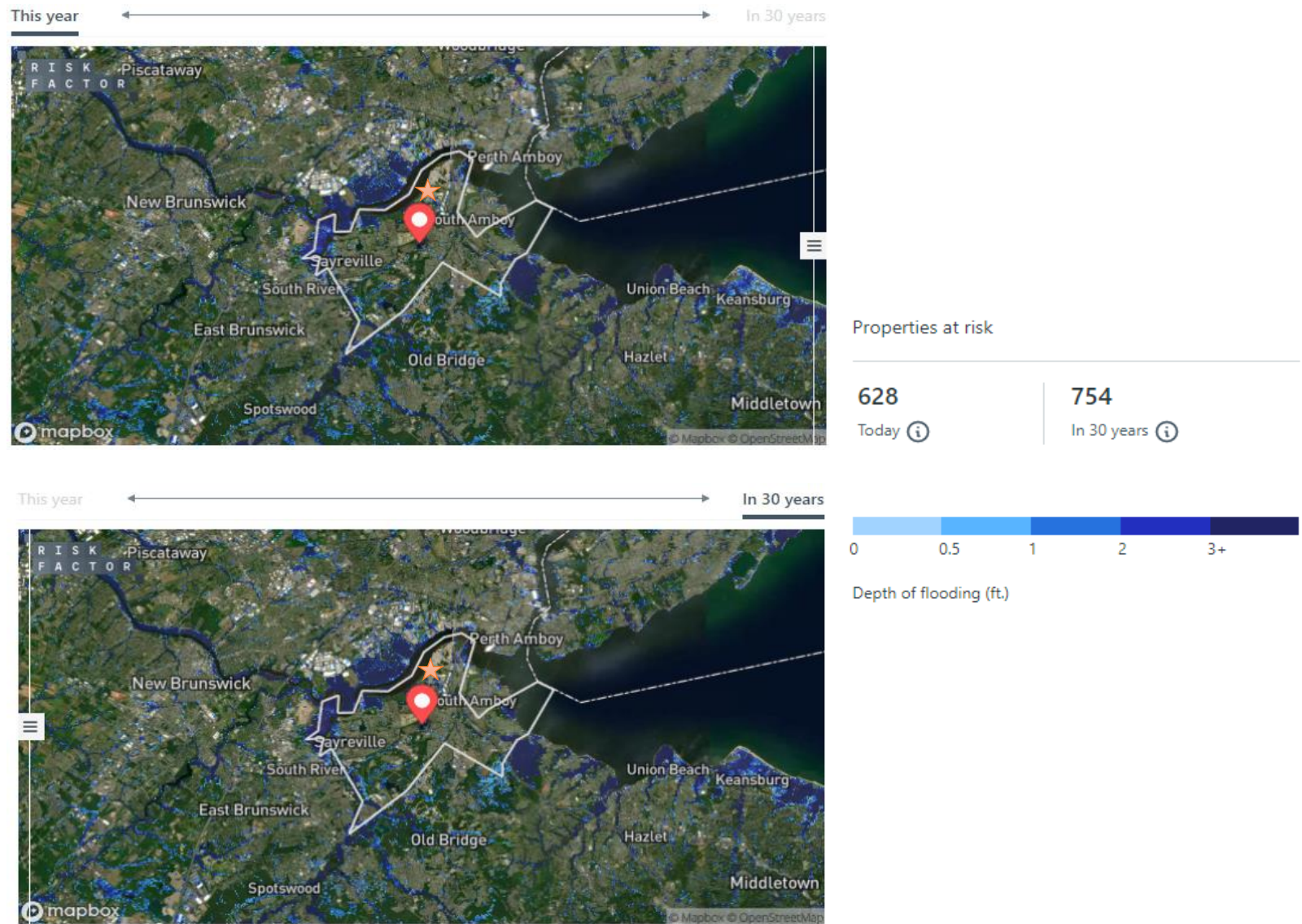


Figure 6

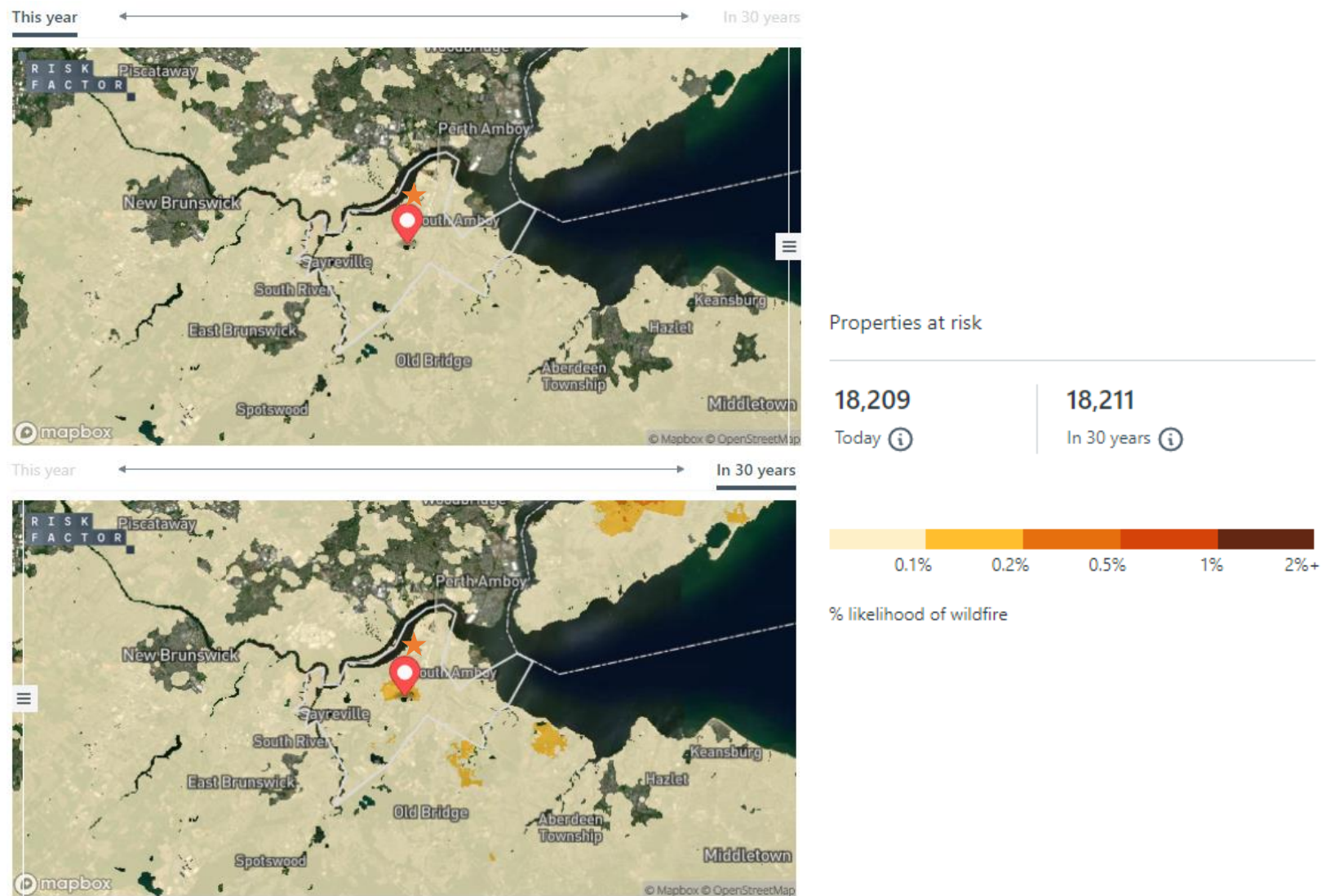


Figure 7

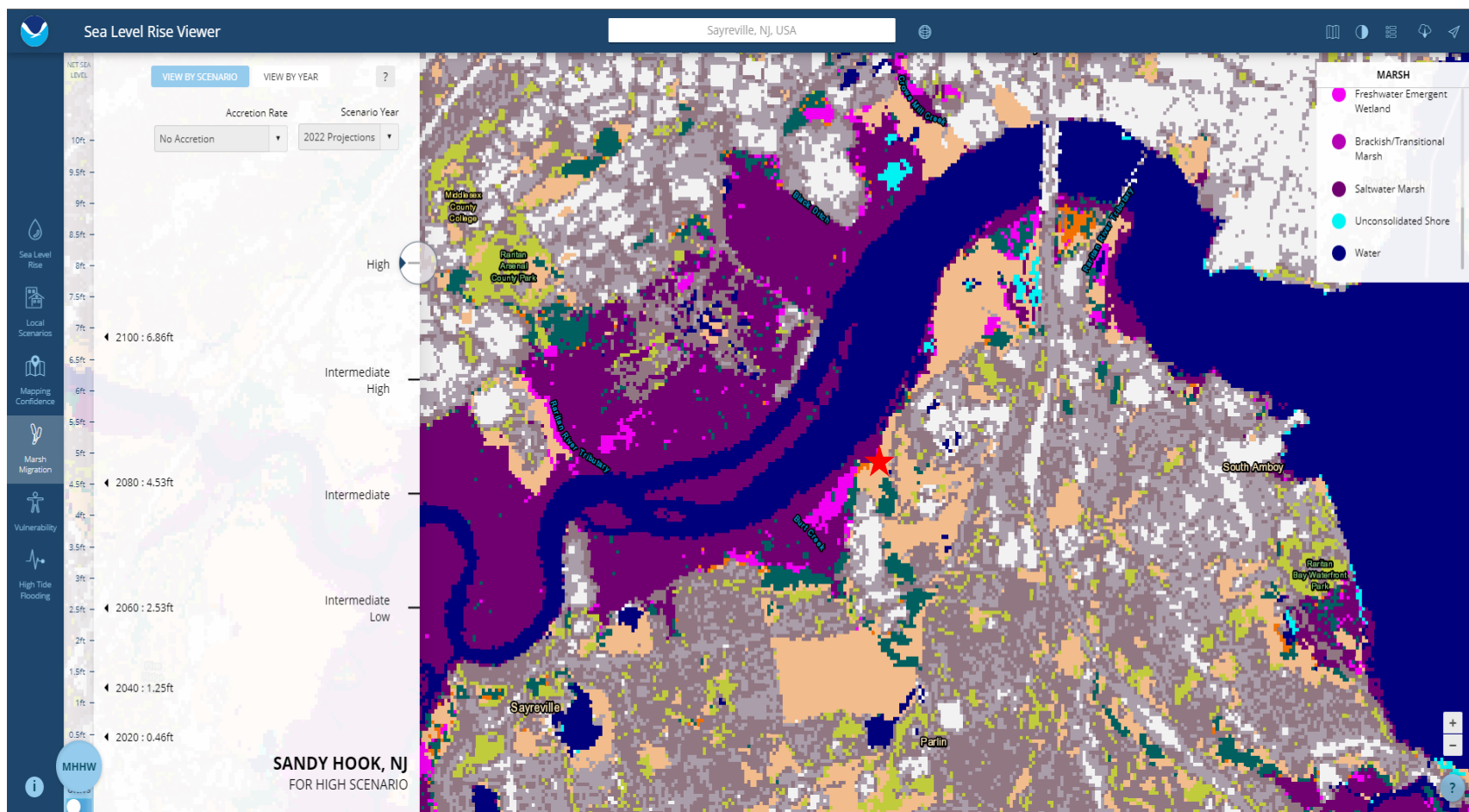


Figure 8

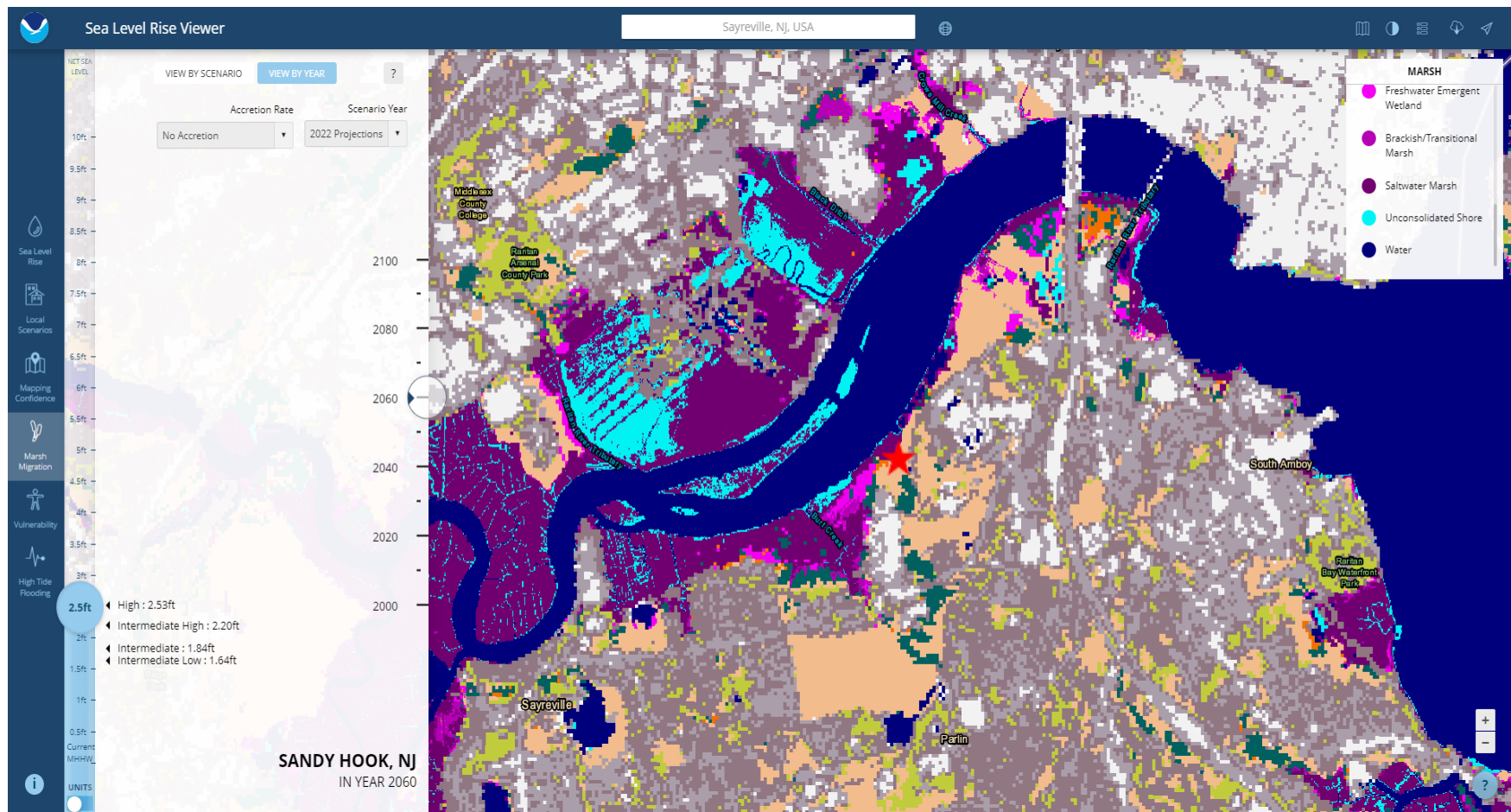


Figure 9

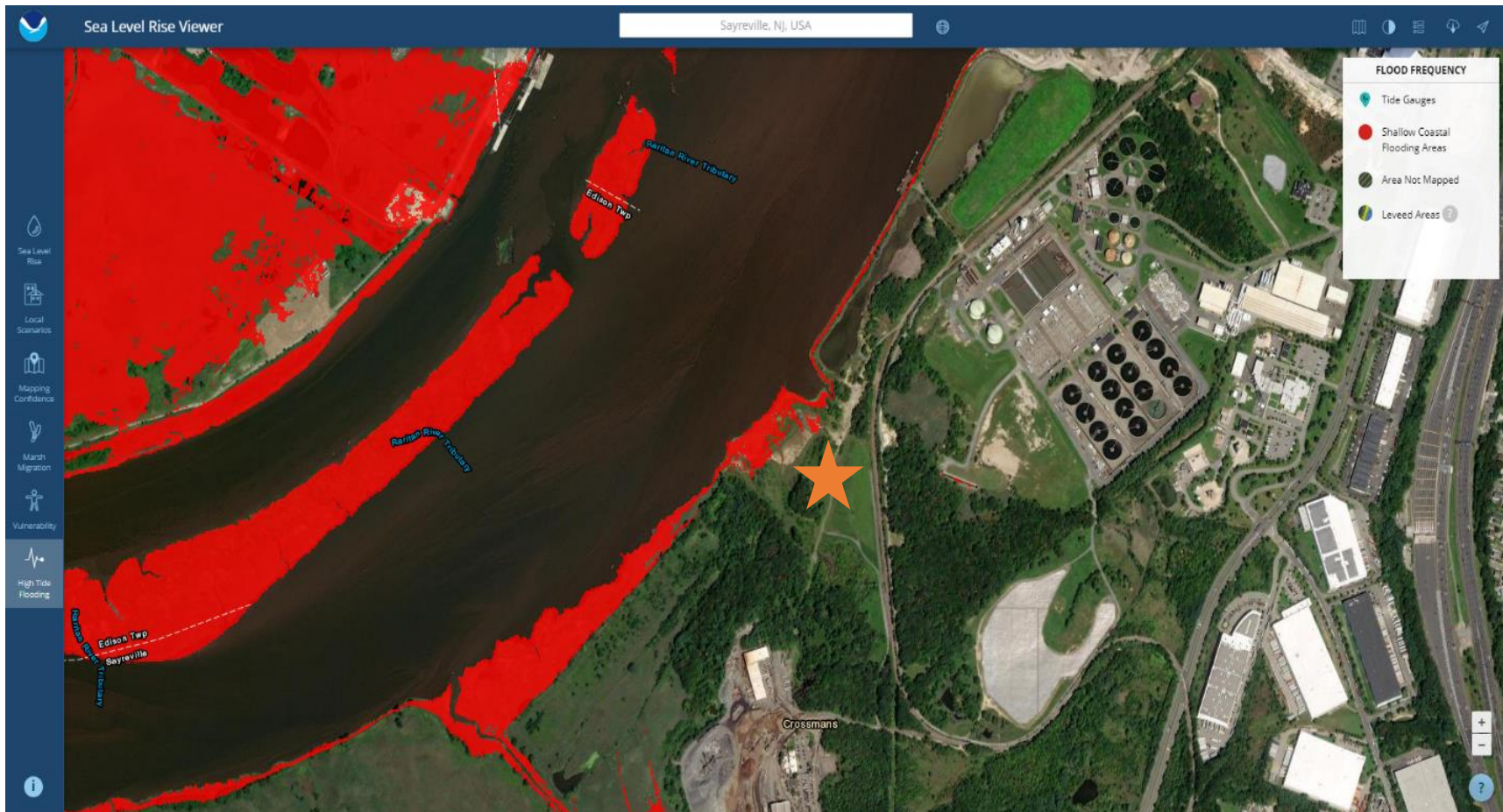


Figure 10